CHINO AIRPORT

Chapter Three
AVIATION FACILITY REQUIREMENTS

Chapter Three

Aviation Facility Requirements

In this chapter, existing components of the airport are evaluated to identify the capacities of the overall system. Once identified, the existing capacity is compared to the forecast activity levels prepared in Chapter Two to determine where deficiencies currently exist, or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the approximate sizing and timing of the new facilities can be made.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed and when they may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

The cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established for Chino Airport that take into consideration the reasonable range of aviation demand projections prepared in Chapter Two.

It is important to consider that the actual activity at the airport may be higher or lower than projected activity levels. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts, or changes in the area's aviation demand.

It is important that the plan accommodate these changes so that San Bernardino County can respond to unexpected changes in a timely fashion. These milestones provide flexibility, while potentially extending this plan's useful life if aviation trends slow over the period.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A
Planning Horizon Milestones
Chino Airport

	2001	Short Term	Intermediate Term	Long Term
Based Aircraft				
Standard General Aviation Aircraft	797	920	1,005	1,180
Vintage Aircraft	171	180	185	195
Total Based Aircraft	968	1,100	1,190	1,375
Operations				
General Aviation	144,999	165,000	178,500	206,300
Air Taxi	349	700	1,200	2,700
Military	143	400	400	400
Total Operations	145,491	166,100	180,100	209,400
Total Annual Instrument Approaches	1,919	2,442	2,765	3,434
Annual Passengers	121,200	147,000	167,500	204,200

AIRFIELD REQUIREMENTS

Airfield facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. Theses components include:

- Runways
- Navigational Approach Aids and Instrument Approaches
- Taxiways
- Airfield Lighting, Marking, and Signage

The adequacy of existing airfield facilities at Chino Airport is analyzed from a number of perspectives within each of these components, including (but not limited to): airfield capacity, runway length, runway pavement strength, Federal Aviation Administration (FAA) design standards, airspace configuration, and air traffic control.

AIRFIELD CAPACITY

An airport's airfield capacity is expressed in terms of its annual service volume (ASV). Annual service volume is a reasonable estimate of the maximum level of aircraft operations that can be accommodated at the airport in a year. Annual service volume accounts for annual differences in runway use, aircraft mix, and weather conditions. The airport's annual service volume was examined utilizing FAA Advisory Circular (AC) *150/5060-5, Airport Capacity and Delay*.

Factors Influencing Annual Service Volume

Exhibit 3A graphically presents the various factors included in the calculation of an airport's annual service volume. These include: airfield characteristics, meteorological conditions, aircraft mix, and demand characteristics (aircraft operations). These factors are described below.

● AIRFIELD CHARACTERISTICS

The layout of the runways and taxiways directly affects an airfield's capacity. This not only includes the location and orientation of the runways, but the percent of time that a particular runway or combination of runways is in use and the length, width, weight bearing capacity, and instrument approach capability of each runway at the airport. The length, width, weight bearing capacity, and instrument approaches available to a runway determine which type of aircraft which may operate on the runway and if operations can occur during poor weather conditions.

Runway Configuration: Chino Airport has three runways. This includes two parallel runways, oriented in an east-west manner, and an intersecting runway, oriented in a northeast-southwest manner. Runway 8R-26L is the longest runway at the airport and currently serves the mix of large business jet aircraft and general aviation aircraft which use the airport. At 4,858 feet long, Runway 8L-26R is capable of serving smaller general aviation piston-powered and turboprop aircraft. Runway 3-21 is 6,003 feet long and can serve a large percentage of the aircraft using Chino Airport.

For this analysis, the completion of the Taxiway C and D reconstruction/relocation projects has been assumed. Therefore, it has been assumed that each runway is served by a full-length parallel taxiway.

The parallel runway configuration provides for maximum capacity at the airport. The 800-foot spacing of the parallel runways at Chino Airport provides for simultaneous landing and/or departure operations during visual conditions. Runway 3-21 limits airfield capacity. When this runway is in use, the parallel runways cannot be used. This limits aircraft arrivals and departures to a single runway, which cannot serve as many aircraft during a given period of time as the parallel runway system.

Runway Use: Runway use is normally dictated by wind conditions. The direction of takeoffs and landings is generally determined by the speed and direction of wind. It is generally safest for aircraft to takeoff and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. At Chino Airport, most aircraft depart to the west (Runway 26R and Runway 26L) due to the prevailing wind flows from the west. For the capacity analysis, the parallel runway configuration was assumed to be used the majority of the time which maximizes capacity.

Exit Taxiways: Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. Each runway is served by four or more exit taxiways.

The airfield capacity analysis gives credit to exits located within a prescribed range from a runway's threshold. This range is based upon the mix index of the aircraft that use the runway. The exits must be at least 750 feet apart to count as separate exits. For Chino Airport, the exit taxiways must be within 2,000 to 4,000 feet from the runway threshold. Following this criteria, each runway is credited with two exits. This reduces capacity by four to six percent.

- METEOROLOGICAL CONDITIONS

Weather conditions can have a significant affect on airfield capacity. Airport capacity is usually highest in clear weather, when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period. This consequently reduces overall airfield capacity.

There are three categories of meteorological conditions each defined by the reported cloud ceiling and flight visibility. Visual Flight Rule (VFR) conditions exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. VFR flight conditions permit pilots to approach, land, or takeoff by visual reference and to see and avoid other aircraft.

Instrument Flight Rule (IFR) conditions exist when the reported ceiling is less than 1,000 feet above ground level and/or visibility is less than three statute miles. Under IFR conditions, pilots must rely on instruments for navigation and guidance to the runway. Other aircraft cannot be seen and safe separation between aircraft must be assured solely by following air traffic control rules and procedures. As mentioned, this leads to increased distances between aircraft which diminishes airfield capacity.

Poor Visibility Conditions (PVC) exist when the cloud ceiling and/or visibility is less than cloud ceiling and visibility

01MP16-3A-2/12/02

Exhibit 3A
FACTORS INFLUENCING
ANNUAL SERVICE VOLUME

minimums prescribed by the instrument approach procedures for the airport. Essentially, the airport is closed to arrivals during PVC conditions.

According to regional data, VFR conditions exist approximately 93 percent of the time, whereas IFR conditions occur approximately five percent of the time, with PVC conditions occurring approximately two percent of the time.

● AIRCRAFT MIX

Aircraft mix refers to the speed, size, and flight characteristics of aircraft operating at the airport. As the mix of aircraft operating at an airport increases to include larger aircraft, airfield capacity begins to diminish. This is due to larger separation distances that must be maintained between aircraft of different speeds and sizes.

Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of single and multi-engine aircraft weighing less than 12,500 pounds. Aircraft within these classifications are primarily associated with general aviation operations, but does include some business turboprop and business jet aircraft (e.g. the Cessna Citation business jet and Beechcraft King Air). Class C consists of multi-engine aircraft weighing between 12,500 and 300,000 pounds. This is broad classification that includes business jets, turboprops, and large commercial airline aircraft. Most of the business jets in the national fleet are included within this category. Class D includes all aircraft over 300,000 pounds and includes wide-bodied and jumbo jets. No aircraft within Class D operate, or are expected to operate, at the airport.

For the capacity analysis, the percentage of Class C aircraft operating at the airport is critical in determining the annual service volume as this class includes the larger and faster aircraft in the operational mix. Aircraft in Category C are estimated to conduct slightly more than 12 percent of operations at Chino Airport. Consistent with projections prepared in the previous chapter, the operational fleet mix at the airport is expected to slightly increase its percentage of Class C through the planning period as business and corporate use of the airport increases through the planning period.

● DEMAND CHARACTERISTICS

Operations, not only the total number of annual operations, but the manner in which they are conducted, have an important effect on airfield capacity. Peak operational periods, touch-and-go operations, and the percent of arrivals impact the number of annual operations that can be conducted at the airport.

Peak Period Operations: For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month are calculated. These figures were derived from the peak period forecasts prepared in Chapter Two.

Touch-and-Go Operations: A touch-and-go operation involves an aircraft making a landing and an immediate takeoff without coming to a full stop or exiting the runway. These operations are normally associated with general aviation training operations. Touch-and-go activity is counted as two operations since there is an arrival and a departure involved. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time than individual operations. Touch-and-go activities represent approximately 44 percent of total annual operations. This level of activity increases hourly capacity by 31 percent.

Percent Arrivals: The percentage of arrivals as they relate to the total operations in the design hour is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. However, except in unique circumstances, the aircraft arrival-departure split is typically 50-50. At the airport, traffic information indicated no major deviation from this pattern, and arrivals were estimated to account for 50 percent of design period operations.

CALCULATION OF ANNUAL SERVICE VOLUME

The preceding information was used in conjunction with the airfield capacity methodology developed by the FAA to determine airfield capacity for Chino Airport.

Hourly Runway Capacity: The first step in determining annual service volume involves the computation of the hourly capacity of each runway in use configuration. The percentage use of each runway, the amount of touch-and-go training activity, and the number and locations of runway exits become important factors in determining the hourly capacity of each runway configuration.

Annual Service Volume: Once the hourly capacity is known, the annual service volume can be determined. Annual service volume is calculated by the following equation:

Annual Service Volume = C x D x H	
C =	weighted hourly capacity
D =	ratio of annual demand to average daily demand during the peak month
H =	ratio of average daily demand to average peak hour demand during the peak month

Following this formula, the current and future annual service volume for Chino Airport has been estimated. **Table 3B** summarizes annual service volume data for Chino Airport through the planning period.

TABLE 3B
Annual Service Volume Comparison

	Annual Operations	Weighted Hourly Capacity	Annual Service Volume	Percent Capacity
Existing Exit Taxiway Configuration				
2001	145,491	153	381,000	38.2%
Short Term	166,100	152	380,000	43.7%
Intermediate Term	180,100	151	377,000	47.8%
Long Term	209,400	149	373,000	56.1%
Additional Exit Taxiways				
2001	145,491	162	405,000	35.9%
Short Term	166,100	161	403,000	41.2%
Intermediate Term	180,100	160	400,000	45.0%
Long Term	209,400	157	391,000	53.6%

- CONCLUSION

Exhibit 3B compares annual service volume to existing and forecast operational levels. The 2001 total of 145,491 operations represented 38.2% of the annual service volume. By the end of the planning period, without taxiway improvements, the total annual operations can be expected to represent 56.1% of annual service volume.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (*NPIAS*), indicates that improvements for airfield capacity purposes should be considered when operations reach 60 percent of the annual service volume. The airport is not expected to cross this threshold through the planning period of this master plan; therefore, additional runways are not expected to be needed at the airport. However, additional airfield capacity can be achieved through the development of additional exit taxiways. As shown in the table, providing for four exit taxiways for landing can increase the annual service volume from 373,000 operations in the long term planning horizon to 391,000 operations. Therefore, additional exit taxiway configurations should be examined for the airport to maximize capacity and reduce delay for aircraft.

RUNWAY ORIENTATION

For the operational safety and efficiency of an airport, it is desirable for the primary runway of an airport's runway system to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA design standards specify that additional runway configurations are needed when the primary runway configuration provides less than 95 percent wind coverage at specific crosswind components. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for small aircraft weighing less than 12,500 pounds and from 13 to 16 knots for aircraft weighing over 12,500 pounds.

The parallel runway system is closely oriented to the prevailing westerly wind flows. Therefore, Runway 8R-26L and Runway 8L-26R serve as the primary runway orientation at the airport. Runway 3-21 serves a crosswind runway during those times when wind flows may be from the northeast or southwest.

The most current 10 years (1991-2000) of wind data has been collected to determine wind coverage for the airport. **Exhibit 3C** summarizes wind coverage for the airport and depicts the wind rose for the airport. As shown in the table, combined, Runway 3-21 and Runways 8L-26R and 8R-26L, provide greater than 99 percent wind coverage for all crosswind components. This exceeds the minimum design requirement discussed above. Therefore, additional runway orientations are not needed at the airport.

As shown in the table, individually, Runway 3-21 and Runways 8L-26R and 8R-26L provide greater than 98 percent coverage for all crosswind components. Since the 95 percent wind coverage standard is met with a single runway orientation at Chino Airport, any additional runways must be examined for their operational capacity benefits. FAA funding may be limited if an additional runway orientation cannot be justified based upon its operational benefit.

For Chino Airport, the prevailing wind flows are from the west. This leads to a greater use of the parallel runways, Runway 8R-26L and Runway 8L-26R, than Runway 3-21. While having the length and width to serve large general aviation aircraft, the Runway 3-21 orientation mostly benefits small aircraft (aircraft less than 12,500 pounds) during those times when winds are from the northeast and crosswind components greater than 10.5 knots on the parallel runway system. The parallel runway system provides sufficient wind coverage for large aircraft when the wind is from the northeast.

Three conceptual alternatives can be considered for Runway 3-21. The first would be to maintain Runway 3-21 to accommodate large aircraft and serve as an alternate to Runway 8R-26L during periods when Runway 8R-26L is closed. As indicated previously, based upon prevailing wind flows and the wind coverage provided by the parallel runway system, Runway 3-21 is not needed by large aircraft. Design and safety requirements applicable to large aircraft must be examined for Runway 3-21 to serve this role. Second, develop and maintain Runway 3-21 to serve small aircraft during those times when the wind is from the northeast and the 10.5 knot crosswind component is exceeded on the parallel runway system. This occurs less than one percent of the time. Lastly, close Runway 3-21 at that time when a major rehabilitation or reconstruction of the runway is needed. Develop the property occupied by the runway for other uses, such as aviation-related development. These alternatives will be more closely examined in Chapter Four.

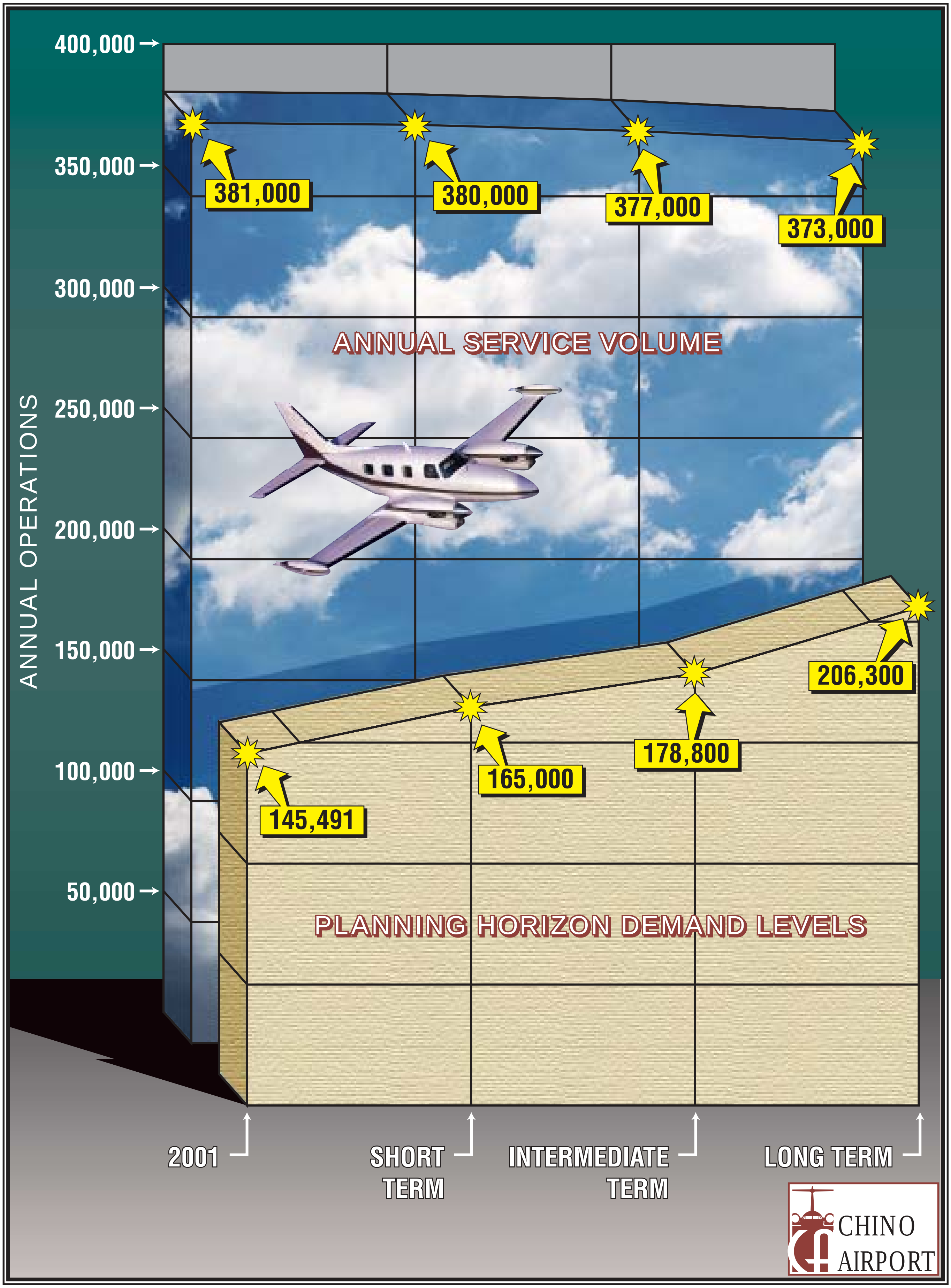


Exhibit 3B
DEMAND VS. CAPACITY

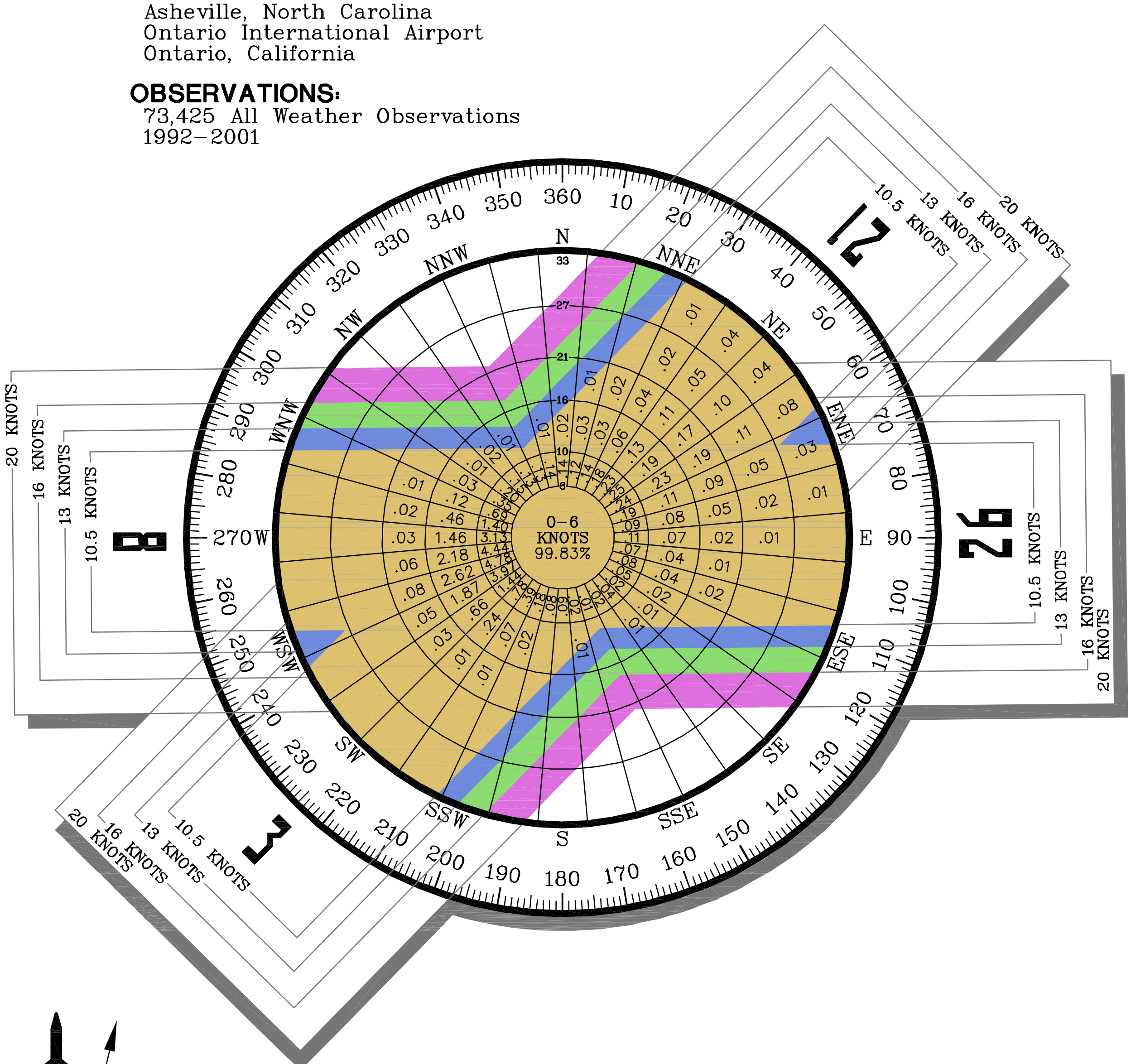
Draft 00MP16-3C-02/15/02

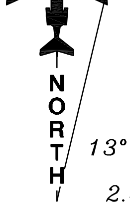
ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 03-21	*98.52%*	*99.59%*	*99.89%*	*99.97%*
Runway 08-26	*98.51%*	*99.18%*	*99.61%*	*99.84%*
Combined	*99.87%*	*99.96%*	*99.98%*	*99.99%*

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Ontario International Airport
Ontario, California

OBSERVATIONS:
73,425 All Weather Observations
1992-2001





Magnetic Variance
13° 26' East (February 2002)
Annual Rate of Change
2.40' West (February 2002)

CHINO AIRPORT

Exhibit 3C
WINDROSE

PHYSICAL PLANNING CRITERIA

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These standards must be determined now since the relocation of these facilities will likely be extremely expensive at a later date.

The most important characteristics in airfield planning are the approach speed and wingspan of the critical design aircraft anticipated to use the airport now or in the future. The critical design aircraft is defined as the most demanding category of aircraft which conducts 500 or more operations per year at the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This code, referred to as the airport reference code (ARC), has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group (ADG) and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.
Category B: Speed 91 knots or more, but less than 121 knots.
Category C: Speed 121 knots or more, but less than 141 knots.
Category D: Speed 141 knots or more, but less than 166 knots.
Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADGs used in airport planning are as follows:

Group I: Up to but not including 49 feet.
Group II: 49 feet up to but not including 79 feet.
Group III: 79 feet up to but not including 118 feet.
Group IV: 118 feet up to but not including 171 feet.
Group V: 171 feet up to but not including 214 feet.
Group VI: 214 feet or greater.

Exhibit 3D depicts representative general aviation aircraft by ARC. In order to determine facility requirements, an ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Chino Airport.

Chino Airport is currently used by a wide variety of standard general aviation and vintage aircraft. Standard general aviation aircraft using the airport include small single and multi-engine aircraft (which fall within approach categories A and B and ADG I) and business turboprop, and jet aircraft (which fall within approach categories B, C, and D and ADGs I, II, and III).

Many of the typical vintage aircraft based using the airport fall within ARCs A-I to B-III. The smaller vintage aircraft include fighter aircraft such as the P-51 Mustang. Larger aircraft include the Douglas DC-3. There are a few military jets based at the airport which would fall within higher approach categories, such as approach categories C and D.

There were 28 based business jets at Chino Airport in 2001. This included a range of Cessna Citation, Learjet, Gulfstream, and Canadair Challenger aircraft. These aircraft fell within ARCs B-I to D-II.

Business jet aircraft are the most demanding standard general aviation aircraft to operate at the airport due to their higher approach speeds, runway take-off requirements, and wingspans when compared to the remaining standard general aviation aircraft which operate at the airport. Business jet aircraft are estimated to conduct more than 2,000 operations annually at the airport. Business jets within ARC C-I and C-II are expected to conduct the majority of these operations.

Vintage aircraft are estimated to conduct more than 1,000 operations annually at the airport. This includes activity associated with the on-airport museums, other based vintage aircraft, and transient users. While this includes a majority of operations by aircraft within ADGs I and II, vintage aircraft within ADG III frequent the airport. There are currently more than five vintage aircraft based at the airport within ADG III.

Typically, more than one aircraft composes the airport's critical design aircraft. One aircraft may be the most critical in terms of runway length, while another the most critical for runway/taxiway widths and separation distances.

The airport's critical aircraft for runway/taxiway widths and separation design must consider the larger wingspans of the vintage aircraft which use the airport and the Boeing 727-200 aircraft based at the airport. The transient and based business jet aircraft define the approach category.

For planning purposes, the airport's current critical aircraft will be defined by several aircraft. Business jets within approach category C define the airport's critical aircraft approach category. The transient and based vintage aircraft within ADG III and based Boeing 727-200, which also falls within ADG III, define the airport's critical aircraft for runway/taxiway width and separation design. Therefore, the airport's current critical ARC must consider the

01MP16-3D-2/12/02

A-I

- Beech Baron 55
- Beech Bonanza
- Cessna 150
- **Cessna 172**
- Piper Archer
- Piper Seneca

A-III, B-III

- **DC-3**
- Convair 580
- Fokker F-27

B-I (less than 12,500 lbs.)

- **Beech Baron 58**
- Beech King Air 100
- Cessna 402
- Cessna 421
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

C-I, D-I

- **Lear** 25, **35**, 55
- Israeli Westwind
- HS 125

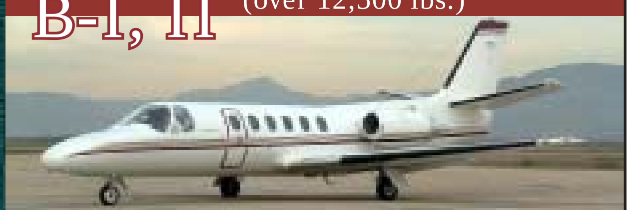
B-II (less than 12,500 lbs.)

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

C-II, D-II

- **Gulfstream** II, III, **IV**
- Canadair 600
- Canadair Regional Jet
- Lockheed JetStar
- Super King Air 350

B-I, II (over 12,500 lbs.)



- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

C-III, D-III

- Boeing Business Jet
- B 727-200
- **Gulfstream V**
- Global Express

Note: Aircraft pictured is identified in bold type.

CHINO AIRPORT

Exhibit 3D
AIRPORT REFERENCE CODES

requirements for approach category C and design group III or ARC C-III.

Future planning should consider the increased use of the airport by larger business jet aircraft. National trends indicate both an increased use of corporate aircraft and the desire to operate larger aircraft. The Boeing Business Jet (BBJ), for example, is the corporate version of the commercial Boeing 737. Airbus is developing a similar business jet based upon the Airbus A-320 design. Although corporate aircraft are larger today than their predecessors, it is unlikely that these aircraft will exceed approach category D or design group III. The BBJ is a C-III aircraft. The Canadair Global Express and Gulfstream are the largest business jets and fall within ARC D-III.

Given all of these considerations, planning for future critical aircraft should include all corporate aircraft up to the BBJ and the Gulfstream V. Therefore, the ultimate ARC for Chino Airport should consider the requirements of approach category D and ADG III or ARC D-III.

Runway 8R-26L provides the greatest length at the airport and presently serves as the primary runway for large aircraft. This runway should ultimately consider ARC D-III design requirements. ARC C-III design requirements are appropriate for Runway 8L-26R since it serves as an alternate to the primary runway.

The appropriate design category for Runway 3-21 should be determined after considering its ultimate role. As mentioned previously, an additional runway orientation is not needed at the airport to meet wind coverage standards since Runways 8R-26L and 8L-26R exceed wind coverage requirements. The analysis to follow will detail the requirements for Runway 3-21 if it is maintained as an alternate runway for large aircraft, or as a runway for small aircraft only.

The design of taxiway and apron areas should consider the wingspan requirements of the most demanding aircraft to operate within that specific functional area on the airport. Transient apron, aircraft maintenance, and repair hangar areas should consider ADG III requirements to accommodate the largest transient business jets and vintage aircraft. T-hangar and small conventional hangar areas should consider ADG I requirements as these commonly serve smaller single and multi-engine piston aircraft.

AIRFIELD SAFETY STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions that could affect the safe operation of aircraft. These include the object free area (OFA), obstacle free zone (OFZ), and runway safety area (RSA).

The OFA is defined as "a two-dimensional ground area surrounding runways, taxiways, and taxilanes which is clear of objects except for objects whose location is fixed by function."

The RSA is defined as "a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The OFZ is defined as a "defined volume of airspace centered above the runway centerline whose elevation is the same as the nearest point on the runway centerline and extends 200 feet beyond each runway end."

The FAA expects these areas to be under the control of the airport and free from obstructions. The dimensional requirements for ARC B-I (small aircraft only), ARC C-III, and ARC D-III are summarized on **Table 3C**. ARC B-I (small aircraft only) would apply to the alternative of developing Runway 3-21 to serve those small aircraft which may be affected by winds from the northeast and may not be able to land on one of the parallel runways. ARC C-III applies to the existing design requirements for Runways 8R-26L and 8L-26R and Runway 3-21 should it be determined that this runway be maintained to serve large aircraft. ARC D-III is applicable to the long term design requirement for Runway 8R-26L.

TABLE 3C
Airfield Safety Area Dimensional Standards

	B-I [1]	C-III	D-III
Runway Safety Area			
Width	120	400	500
Length Beyond Runway End	240	1,000	1,000
Object Free Area			
Width	250	800	800
Length Beyond Runway End	240	1,000	1,000
Obstacle Free Zone			
Width	250	400	400
Length Beyond Runway End	200	200	200

Source: FAA Airport Design Software Version 4.2D
[1] Small aircraft only.

Runway 8R-26L and 8L-26R do not fully meet existing ARC C-III RSA or OFA design standards. The localizer for the instrument landing system (ILS) approach to Runway 26R is located in the safety area behind the Runway 8L end. The RSA behind the Runway 26R end extends across the abandoned Grove Avenue right-of-way and is crossed by an open ditch. The RSA also extends across a fenced area enclosing a series of above-ground natural gas valves.

The Runway 8R-26L OFA is obstructed by fencing surrounding two water storage tanks for fire suppression near the Runway 26L end. Fencing surrounding a water well pump along Euclid Avenue also obstructs the OFA for both Runway 8R-26L and Runway 8L-26R. While the segmented circle and lighted wind cone are within the OFA for both Runway 8R-26L and Runway 8L-26R, these facilities are allowed in the OFA since they are required for air navigation and are on frangible bases.

Runway 3-21 would not meet ARC C-III RSA and OFA design standards, if this design standard were applied to the runway. An ARC C-III RSA and OFA would extend beyond the existing airport boundary at each end of Runway 3-21. At the Runway 3 end, the RSA would be obstructed by Kimball Avenue. At the Runway 21 end, the RSA and OFA would extend across Merrill Avenue to the north and the abandoned Grove Avenue right-of-way. An open ditch extends along Grove Avenue.

Each runway meets OFZ design requirements. The alternatives analysis will examine options available to meet these critical design requirements.

RUNWAY LENGTH

The determination of runway length requirements should consider both takeoff and landing requirements. Takeoff requirements are a factor of airport elevation, mean maximum temperature of the hottest month, the critical aircraft type expected to use the airport, and stage length of the longest nonstop trip destinations. Aircraft performance declines as each of these factors increase. Landing requirements are a factor of airport elevation, aircraft landing weight, and the runway condition (i.e. dry conditions or wet conditions).

For calculating runway length requirements at Chino Airport, the airport elevation is 652 feet above mean sea level (MSL) and the mean maximum temperature of the hottest month is 96 degrees Fahrenheit (July). For Chino Airport, summertime temperatures are a primary factor in determining runway length requirements.

Using the specific data for Chino Airport described above, runway length requirements for the various classifications of aircraft that may operate at the airport have also been examined using the FAA Airport Design computer program Version 4.2D, which groups general aviation aircraft into several categories, reflecting the percentage of the fleet within each category and useful load (passengers and fuel) of the aircraft. **Table 3D** summarizes FAA recommended runway lengths for Chino Airport.

The appropriate FAA runway length planning category for Runway 8R-26L is “100 percent of large aircraft at 60 percent useful load”. As shown in the table, the FAA recommends a runway length of 6,100 feet for this runway length category. At 7,000 feet, Runway 8R-26L exceeds this minimum requirement.

TABLE 3D **Runway Length Requirements**	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,800 feet
95 percent of these small airplanes	3,400 feet
100 percent of these small airplanes	4,000 feet
Small airplanes with 10 or more passenger seats	4,500 feet
Large airplanes between 12,500 and 60,000 pounds	
75 percent of large aircraft at 60 percent useful load	5,500 feet
100 percent of large aircraft at 60 percent useful load	6,100 feet

Small Aircraft - Aircraft less than 12,500 pounds
Source: FAA Airport Design computer program Version 4.2D

The appropriate FAA runway length planning category for Runway 8L-26R is "75 percent of large aircraft at 60 percent useful load." As shown in the table, the FAA recommends a runway length of 5,500 feet for this runway length category. Presently, Runway 8L-26R is 4,838 feet long. Therefore, consideration may be given to extending Runway 8L-26R an additional 642 feet to meet this recommended runway length.

The appropriate planning category for small aircraft is "75 percent of small airplanes with less than 10 passenger seats". At Chino Airport, the FAA recommends a runway length of 2,800 feet to meet the requirements of this category of aircraft. This would be the minimum runway length to consider if Runway 3-21 is maintained to serve small aircraft within ARC B-I (small aircraft only).

For comparison, actual runway length requirements for common business jets expected to operate at the airport at the mean daily maximum temperature listed previously have been determined for the airport. The takeoff and landing requirements for these aircraft are included in **Table 3E**.

As shown in the table, takeoff length requirements vary from a less demanding 4,000 feet for the Cessna Citation V to 7,000 feet for the Learjet 60. Landing requirements vary from 2,800 feet to 4,400 feet.

Based upon these actual departure and landing requirements, a primary runway length of 7,000 feet is needed to fully serve the business jets expected to operate at the airport. Therefore, the existing length of Runway 8R-26L should be maintained through the planning period.

Extending Runway 8L-26R would enable this runway to serve a larger majority of business jet aircraft. As evident from **Table 3E**, extending Runway 8L-26R to 5,500 feet would allow this runway to serve seven of the 13 aircraft listed. If Runway 8L-26R remained at its present length of 4,858 feet, it would only be able to serve three of the 13 aircraft listed. The additional length on Runway 8L-26R would enable this runway to serve a larger portion of the fleet mix expected to operate at the airport and enhance airfield capacity by allowing for simultaneous approach and departures for the majority of aircraft expected to operate at the airport.

TABLE 3E
Business Jet Runway Length Requirements

Aircraft	Airport Reference Code	Maximum Takeoff Weight (pounds)	Maximum Landing Weight (pounds)	Takeoff Distance (feet)	Landing Distance (feet)
Beechcraft Beechjet 400	C-I	16,100	15,700	5,400	4,400
Citation I	B-I	11,850	11,350	4,300	2,800
Citation II	B-II	14,100	13,500	5,700	3,200
Citation III	C-II	22,000	20,000	4,900	3,300
Citation V	B-II	15,900	15,200	4,000	3,600
Falcon 10	B-II	18,740	17,640	4,600	3,200
Falcon 20	B-II	28,660	27,320	5,500	3,600
Gulfstream IV	D-II	74,600	66,000	6,500	3,600
Learjet 31A	C-I	17,000	16,000	5,300	3,600
Learjet 35/36	C-I	18,300	15,300	6,300	3,700
Learjet 45	C-I	20,500	19,200	5,900	3,300
Learjet 55	D-I	21,500	18,000	6,700	4,000
Learjet 60	D-I	23,500	19,500	7,000	4,300

Assumptions:
Zero wind, zero runway gradient
Maximum takeoff weight
Maximum landing weight, wet runways
96 degrees Fahrenheit

Sources: Aircraft Performance Guides (Selected Manufacturers)

RUNWAY WIDTH

Runway width is based upon the planning ARC for each runway. For ARC C-III and ARC D-III, the FAA specifies a runway width of 100 feet. For ARC B-I (small aircraft only), the FAA design standards specify a runway width of 60 feet. As shown on **Exhibit 3E**, all runways at the airport are 150 feet wide, exceeding these design requirements.

RUNWAY PAVEMENT STRENGTH

The most important feature of airfield pavement is its ability to withstand use by aircraft of significant weight on a regular basis. Currently, this includes a wide range of standard general aviation aircraft and vintage aircraft.

The pavement strength for both Runway 8R-26L and Runway 3-21 are sufficient to serve the mix of large aircraft expected to operate at the airport through the planning period. Additional pavement strength should be considered for Runway 8L-26R. This runway has a pavement strength rating of 12,000 pounds single wheel loading (SWL). To serve business jet aircraft on a regular basis, a pavement strength rating of 30,000 pounds SWL and 60,000 dual wheel loading (DWL) should be considered for Runway 8L-26R.

NAVIGATIONAL AIDS AND INSTRUMENT APPROACH PROCEDURES

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which properly equipped aircraft and pilots translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Chino Airport include a very high frequency omnidirectional range (VOR) facility, nondirectional beacon (NDB), global positioning system (GPS), and Loran-C. These systems are sufficient for navigation to and from the airport; therefore, no other navigational aids are needed at the airport.

GPS was developed and deployed by the United States Department of Defense as a dual-use (civil and military) radio navigation system. GPS initially provided two levels of service: the GPS standard positioning system (SPS), which supported civil GPS uses; and the GPS precise positioning system (PPS), which was restricted to U.S. Armed Forces, U.S. federal agencies and selected allied armed forces, and government use.

The differences in GPS signals have been eliminated and civil users now access the same signal integrity as federal agencies. A GPS modernization effort is underway by the FAA and focuses on augmenting the GPS signal to satisfy requirements for accuracy, coverage, availability, and integrity. For civil aviation use, this includes the development of two separate augmentation systems: the Wide Area Augmentation System (WAAS) and Local Area Augmentation System (LAAS). The WAAS uses a system of reference stations to correct signals from GPS satellites for improved navigation and approach capabilities. Where the present GPS provides for enroute navigation and limited instrument approach (nonprecision) capabilities, WAAS will provide for Category I (cloud ceilings 200 feet above the ground and visibilities restricted to one-half mile) approach capability at nearly every runway end equipped with an instrument approach procedure.

The LAAS varies from the WAAS since the corrected GPS signals are broadcast directly to aircraft within line-of-sight of a ground reference station. The LAAS is expected to support approach capability below Category I and be implemented in areas which are not supported by the WAAS upgrade. The LAAS may also be able to support runway incursion warnings, high-speed turnoffs, missed approaches, 01MP16-3E-2/13/02

RUNWAYS

EXISTING	SHORT TERM NEED	LONG TERM NEED
Runway 8R-26L ARC C-III 7,000' x 150' 75,000 SWL • 150,000 DWL • 215,000 DTWL *Runway Safety Area* 250' each side of runway centerline 1,000' beyond each runway end *Object Free Area* 400' each side of runway centerline 1,000' beyond each runway end *Runway Protection Zone Each End* Inner Width - 500' • Outer Width - 1,010' Length - 1,700'	**Runway 8R-26L** ARC C-III 7,000' x 150' 75,000 SWL • 150,000 DWL • 215,000 DTWL *Runway Safety Area* 250' each side of runway centerline 1,000' beyond each runway end *Object Free Area* 400' each side of runway centerline 1,000' beyond each runway end Remove Obstructions *Runway Protection Zone 26L* Inner Width - 1,000' • Outer Width - 1,700' Length - 2,500' *Runway Protection Zone 8R* Inner Width - 500' • Outer Width - 1,010' Length - 1,700'	**Runway 8R-26L** ARC D-III 7,000' x 150' 75,000 SWL • 150,000 DWL • 215,000 DTWL *Runway Safety Area* 250' each side of runway centerline 1,000' beyond each runway end *Object Free Area* 400' each side of runway centerline 1,000' beyond each runway end *Runway Protection Zone 26L* Inner Width - 1,000' • Outer Width - 1,700' Length - 2,500' *Runway Protection Zone 8R* Inner Width - 500' • Outer Width - 1,010' Length - 1,700'
Runway 8L-26R ARC C-III 4,838' x 150' 12,000 SWL *Runway Safety Area* 200' each side of runway centerline 1,000' beyond each runway end *Object Free Area* 400' each side of runway centerline 1,000' beyond each runway end *Runway Protection Zone 26R* Inner Width - 1,000' • Outer Width - 1,700' Length - 2,500' *Runway Protection Zone 8L* Inner Width - 500' • Outer Width - 1,010' Length - 1,700'	**Runway 8L-26R** ARC C-III 4,838' x 150' 12,000 SWL *Runway Safety Area* 200' each side of runway centerline 1,000' beyond each runway end Remove Obstructions *Object Free Area* 400' each side of runway centerline 1,000' beyond each runway end Remove Obstructions *Runway Protection Zone Each End* Inner Width - 500' • Outer Width - 1,010' Length - 1,700'	**Runway 8L-26R** ARC C-III 5,500' x 100' 30,000 SWL • 60,000 DWL *Runway Safety Area* 200' each side of runway centerline 1,000' beyond each runway end *Object Free Area* 400' each side of runway centerline 1,000' beyond each runway end *Runway Protection Zone Each End* Inner Width - 500' • Outer Width - 1,010' Length - 1,700'
Runway 3-21 6,003' x 150' 21,000 SWL • 130,000 DWL	**Runway 3-21** Determine Role and Requirements in Alternatives Analysis	**Runway 3-21** Determine Role and Requirements in Alternatives Analysis

TAXIWAYS

EXISTING	SHORT TERM NEED	LONG TERM NEED
TAXIWAYS	**TAXIWAYS**	**TAXIWAYS**
Parallel Taxiways Taxiway C - 50' wide, 400' from runway centerline Taxiway D - 50' wide, 400' from runway centerline Taxiway N - 75' wide, 400' from runway centerline Taxiway L, M - 75' wide, 400' from runway centerline	**Parallel Taxiways** Taxiway C - 50' wide, 400' from runway centerline Taxiway D - 50' wide, 400' from runway centerline Taxiway N - 75' wide, 400' from runway centerline Taxiway L, M - 75' wide, 400' from runway centerline	**Parallel Taxiways** Taxiway C - 50' wide, 400' from runway centerline Taxiway D - 50' wide, 400' from runway centerline Taxiway N - 75' wide, 400' from runway centerline Taxiway L - Extend to 8R end, 50' wide, 400' from runway centerline Taxiway M - Extend full length of Runway 3-21, 50' wide, 400' from runway centerline
Connecting/Exit/Entrance Taxiways Taxiway AA, A - 40' wide Taxiway B, E, F, G, H, J, K, L - 50' wide Taxiway M - 75' wide	**Connecting/Exit/Entrance Taxiways** Taxiway AA, A - 50' wide Taxiway B, E, F, G, H, J, K, L, M - 50' wide Additional Exit Taxiways Holding Aprons Each End • Blast Pads Each End	**Connecting/Exit/Entrance Taxiways** Taxiway AA, A - 50' wide Taxiway B, E, F, G, H, J, K, L, M - 50' wide Additional Exit Taxiways, Runway 8R-26L Holding Aprons Each End • Blast Pads Each End

HELIPAD

EXISTING	SHORT TERM NEED	LONG TERM NEED
Temporary Helipad Near ATCT	2 Parking Positions Lighted	2 Parking Positions Lighted

KEY

ARC - Aircraft Reference Code
SWL - Single Wheel Gear Loading
DWL - Dual Wheel Gear Loading
DWTL - Dual Wheel Tandem Gear Loading

Note: New facility requirements are shown in colored type.

CHINO AIRPORT

Exhibit 3E
AIRCRAFT OPERATIONAL
AREA REQUIREMENTS

departures, vertical takeoffs, and surface operations.

Once augmented, GPS will become the primary federally-provided radio-navigation system. During the transition, the FAA plans to phase-out existing navigational aids as dependence on these systems is reduced by the capabilities of the GPS system. Ultimately, the ILS at Chino Airport could be expected to be replaced by GPS.

Instrument Approach Procedures

Instrument approach procedures have been established for the airport using the VOR and GPS navigational aids and ILS installed at the airport. The instrument approach procedures consist of a series of predetermined maneuvers established by the FAA for navigation during inclement weather conditions.

The ILS provides for the best visibility and cloud ceiling minimums of both instrument approach procedures available for Chino Airport. As detailed previously in Chapter One, pilots using the ILS 26R can approach and land at the airport when cloud ceilings are as low as 200 feet above the ground and visibility is restricted to ¾-mile. Appendix 16 of FAA AC 150/5300-13, *Airport Design*, Draft Change 7, details the requirements for new instrument approach procedures. According to Appendix 16, Chino Airport meets all the requirements for a precision instrument approach procedure with visibility minimums to ½-mile with the exception of having installed approach lighting equipment. Appendix 16 indicates that if a medium intensity approach lighting system with runway alignment indicator lights (MALSR) was available, the ILS visibility minimums could be lowered by ¼-mile to ½-mile.

Consideration should be given to relocating the ILS equipment to the Runway 26L end. This runway provides the longest length at the airport and is expected to serve the full-range of general aviation aircraft to operate at Chino Airport. Typically, the ILS is situated along the primary and longest runway to ensure that all aircraft expected to operate at the airport can take advantage of the low cloud ceiling and visibility minimums afforded by the ILS equipment. With the ILS now situated along Runway 26R, aircraft which may not be able to land on Runway 26R (due its shorter runway length) must follow the established circling visibility and cloud ceiling minimums for the ILS approach. For aircraft with higher approach speeds, the visibility minimums increase by as much as 1¼-miles. Cloud ceiling minimums increase by 400 feet for all aircraft. This reduces the effectiveness of the ILS approach and reliability of the airport to operators, which may be prevented from using the airport during low visibility and cloud ceiling situations.

Presently, the ILS equipment is owned and operated by the FAA. Consideration may be given to relocating the ILS to the Runway 26L end to locate the ILS with the longest runway at the airport so that it can be safely used by all aircraft using Chino Airport.

No additional instrument approach capabilities are needed for the airport. Runway 8L-26R is located too close to Runway 8R-26L to allow for simultaneous instrument approaches. Instrument approach procedures are not needed for Runway 3-21 since it may only be needed to serve small aircraft during visual conditions.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

When the Taxiways C and D relocation/reconstruction project is complete in 2002, each runway at the airport will be served by a full-length parallel taxiway. Consideration should be given to ultimately extending Taxiway L to the full-length of Runway 8R-26L. This will allow aircraft landing Runway 8R-26L, destined for the apron areas north of the runway, to exit along the north side of the runway. This will eliminate the need to exit to parallel Taxiway N to access a taxiway connecting Runway 8R-26L with the apron areas to the north. The current practice of exiting to Taxiway N increases taxi times as aircraft must, at times, wait for landing of departing aircraft prior to crossing-over Runway 8R-26L to taxi to the north.

As mentioned previously, to increase airfield safety and capacity, facility planning should consider the development of additional exit taxiways. As noted in the airfield capacity analysis, additional exit taxiways would increase the annual service volume of the airport.

Presently, only Taxiways B and G connect Runway 8R-26L to either Apron Area A or Apron Area B. Facility planning should include extending additional taxiways between these areas and Runway 8R-26L to provide additional capacity and provide a more direct route to landside areas.

The FAA has established standards for taxiway width and runway/taxiway separation distances. Taxiway width is determined by the ADG of the most demanding aircraft to use the taxiway. According to FAA design standards, the minimum taxiway width for ADG III is 50 feet. With the exception of Taxiways AA and A (which are 40 feet wide), all taxiways meet or exceed this requirement. Facility planning should include widening Taxiways AA and A to 50 feet.

Design standards for the separation distances between runways and parallel taxiways are based primarily on the ARC for that particular runway and the type of instrument approach capability. FAA design standards specify a runway/taxiway separation distance of 400 feet for a C-III or D-III runway with a precision instrument approach. All parallel taxiways are located 400 feet from the runway centerlines at the airport.

Holding aprons provide an area for aircraft to prepare for departure off the taxiway and allow aircraft to bypass other aircraft which are ready for departure. The existing holding aprons should be maintained at the airport and provided at each runway end.

HELIPAD

The airport does not have a designated helipad. A temporary helipad has been marked on the apron area near the airport traffic control tower (ATCT). The previous helipad was located north of Taxiway D; however, it was removed to provide for the relocation of the taxiway. Facility planning should include establishing a designated helipad at the airport. This should be supplemented with two parking positions and be lighted to allow for operations at night and during poor visibility conditions.

LIGHTING AND MARKING

Currently, there are a number of lighting and pavement marking aids serving pilots using the Chino Airport. These are summarized on **Exhibit 3F**. These lighting and marking aids assist pilots in locating the airport during night or poor weather conditions, as well as assist in the ground movement of aircraft.

Identification Lighting

The location of an airport at night is universally indicated by a rotating beacon. The rotating beacon at the airport is located north of the runway, along Merrill Avenue. The rotating beacon is sufficient and should be maintained in the future.

Runway and Taxiway Lighting

Runway and taxiway lighting utilizes light fixtures placed near the pavement edge to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility in order to maintain safe and efficient access to and from the runway and aircraft parking areas.

Runway 8R-26L and Runway 3-21 are equipped with medium intensity runway lighting (MIRL). Runway 8L-26R is equipped with high intensity runway lighting (HIRL). The Runway 8R-26L MIRL would need to be converted to HIRL if the ILS equipment is relocated to this runway.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. Presently, all taxiways are lighted with the exception of Taxiways AA and A. Facility planning should include installing medium intensity taxiway lighting (MITL) on these taxiways and any future taxiways.

Airfield Signs

Lighted directional and hold signs are installed at the airport. This signage identifies runways, taxiways, and apron areas. These signs aid pilots in determining their position on the airport and provide directions to their desired location on the airport. These lighting aids should be maintained through the planning period.

Lighted distance remaining signs are in place along Runway 8R-26L. These signs are placed in 1,000-foot intervals and identify the length of runway remaining. Similar signs should be planned for Runway 8L-26R.

Pilot-Controlled Lighting

Chino Airport does not have an operational pilot-controlled lighting (PCL) system. While the Runway 3-21 lighting is connected to a PCL system, the PCL system has not been activated.

PCL systems can benefit the operation of an airport. PCL systems reduce airfield operational costs by reducing the intensity of, or turning off, airfield lighting systems when they are not in use. Additionally, a PCL system allows pilots to control the intensity of runway and taxiway lighting using the radio transmitter in the aircraft. A PCL system for the primary runways used at night should be considered for Chino Airport for these reasons.

Visual Approach Lighting

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual descent information during landings to the runway, visual glideslope indicators are commonly provided at airports. A precision approach path indicator (PAPI-4) is installed at the Runway 8R, 26L, and 26R ends. A visual approach slope indicator (VASI-4) is installed at the Runway 3, 21, and 8L ends. These systems are appropriate for the mix of aircraft currently operating at the airport and should be maintained through the planning period. Consideration may be given to replacing the VASI-4 with the newer design PAPI-4 which are less costly to maintain and operate.

Approach Lighting

Approach lighting systems provide the basic means to transition from instrument flight to visual flight for landing. No approach lighting system is presently installed at the airport. As mentioned previously, a medium intensity approach lighting system with runway alignment lighting (MALSR) used in conjunction with the ILS can reduce visibility minimums by ¼-mile to ½-mile. Consideration should be given to installing a MALSR at the Runway 26L end should the existing ILS equipment be moved from Runway 26R to Runway 26L.

Runway End Identification Lighting

Runway end identification lighting provides the pilot with a rapid and positive identification of the runway end. The most basic system involves runway end identifier lights (REILs). REILs are presently installed at the Runway 21 runway end; however, the system is not in operation. As REILs provide pilots with the ability to

01MP16-3F-2/12/02

EXISTING	SHORT TERM NEED	LONG TERM NEED
INSTRUMENT APPROACH PROCEDURES		
ILS Approach 3/4 mile visibility, 200' cloud ceiling minima All Approach Categories **VOR or GPS-B** App. Cat A - 1 mile visibility, 900' cloud ceiling minima App. Cat B - 1 1/4 mile visibility, 900' cloud ceiling minima App. Cat C - 2 1/2 mile visibility, 900' cloud ceiling minima App. Cat D - 2 3/4 mile visibility, 900' cloud ceiling minima	**ILS Approach** Move to Runway 26R 1/2 mile visibility, 200' cloud ceiling minima All Approach Categories	**ILS Approach** 1/2 mile visibility, 200' cloud ceiling minima All Approach Categories
AIRFIELD LIGHTING AND MARKING		
Rotating Beacon	Rotating Beacon	Rotating Beacon
Medium Intensity Runway Edge Lighting 3-21, 8R-26L	Medium Intensity Runway Edge Lighting 3-21	Medium Intensity Runway Edge Lighting 3-21
High Intensity Runway Edge Lighting 8L-26R	High Intensity Runway Edge Lighting 8L-26R, 8R-26L	High Intensity Runway Edge Lighting 8L-26R, 8R-26L
Medium Intensity Taxiway Lighting All taxiways except AA & A	Medium Intensity Taxiway Lighting All taxiways	Medium Intensity Taxiway Lighting All taxiways
Lighted Runway/Taxiway Directional Signage	Lighted Runway/Taxiway Directional Signage	Lighted Runway/Taxiway Directional Signage
Precision Approach Path Indicator 8L, 26L, 26R	Precision Approach Path Indicator All runway ends	Precision Approach Path Indicator All runway ends
Visual Approach Slope Indicator 3, 21, 8L	Visual Approach Slope Indicator Convert to PAPI	Visual Approach Slope Indicator Convert to PAPI
Runway End Identifier Lights 21[1]	Runway End Identifier Lights 8R, 8L, 26R	Runway End Identifier Lights 8R, 8L, 26R
Distance Remaining Signs 8R-26L	Approach Lighting MALSR 26L	Approach Lighting MALSR 26L
Nonprecision Runway Markings 8L, 8R, 26L, 3, 21	Distance Remaining Signs 8L-26R, 8R-26L	Distance Remaining Signs 8L-26R, 8R-26L
Precision Runway Markings 26R	Nonprecision Runway Markings 8R, 8L, 26R, 3, 21	Nonprecision Runway Markings 8R, 8L, 26R, 3, 21
Basic Marking 8L	Precision Runway Markings 26L	Precision Runway Markings 26L
Taxiway Centerline Markings, Aircraft Hold Position Markings	Taxiway Centerline Markings ,Aircraft Hold Position Markings	Taxiway Centerline Markings ,Aircraft Hold Position Markings
	Pilot Controlled Lighting	Pilot Controlled Lighting
WEATHER FACILITIES		
Automated Surface Observation System	Automated Surface Observation System	Automated Surface Observation System
Lighted Wind Indicator	Lighted Wind Indicator	Lighted Wind Indicator
Segmented Circle	Segmented Circle	Segmented Circle

KEY

ILS - Instrument Landing System
VOR - Very High Frequency Omnidirectional Range Facility
GPS - Global Positioning System
MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights

[1] Inoperative

Note: New facility requirements are shown in colored type.

CHINO AIRPORT

Exhibit 3F
AIRFIELD SUPPORT REQUIREMENTS

identify the runway ends and distinguish this lighting from other lighting on the airport and in the approach areas, REILs should be considered for the Runway 8R, 8L, and 26R ends.

Pavement Markings

Pavement markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, *Marking of Paved Areas on Airports*, provides the guidance necessary to design an airport's markings. Runway 8R-26L and Runway 3-21 are equipped with nonprecision runway markings. Runway 26R is equipped with precision runway markings. Runway 8L is equipped with basic markings. The Runway 26L nonprecision markings will need to be upgraded to precision runway makings if the ILS is moved to Runway 26L. The Runway 8L markings should be upgraded to non-precision markings.

Taxiway and apron areas also require marking to assure that aircraft remain on the pavement. Yellow centerline stripes are currently painted on all taxiway and apron surfaces at the airport to provide this guidance to pilots. Besides routine maintenance, these markings will be sufficient through the planning period.

OTHER FACILITIES

The airport has a lighted wind cone which provides pilots with information about wind conditions. A segmented circle provides traffic pattern information to pilots. These facilities are required when the airport is not served by a 24-hour ATCT. These facilities are sufficient and should be maintained in the future.

The automated surface observation system (ASOS) is an important component to airfield operations as it notifies pilots of local weather conditions. This system should be maintained through the planning period and upgraded as needed.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling aircraft and passengers while on the ground. These facilities provide the essential interface between air and ground transportation modes. The capacities of various components of each area were examined in relation to projected demand to identify future landside facility needs. This includes:

- General Aviation Terminal
- Aircraft Hangars
- Aircraft Parking Aprons
- Vehicle Access
- Airport Support Facilities

AIRCRAFT STORAGE HANGARS

The demand for aircraft storage hangars typically depends upon the number and type of aircraft expected to be based at the airport. For planning purposes, it is necessary to estimate hangar requirements based upon forecast operational activity. However, hangar development should be based on actual demand trends and financial investment conditions.

Presently, there are approximately 436 separate T-hangar/executive hangars in 20 buildings. There are over 500 aircraft in these hangars, indicating there are many hangars with multiple aircraft. There are 66 portable hangars. Conventional hangar space is presently occupied by commercial aviation enterprises. This hangar space is used for both storage and aircraft/aviation services. Hangars F-340 and F-360 are presently vacant.

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is in more sophisticated (and consequently more expensive) aircraft. Therefore, many hangar owners prefer hangar space to outside tiedowns. Future hangar requirements for the airport are summarized on **Exhibit 3G**. Museum hangar requirements have not been determined as new hangar space will be dependent upon museum needs and resources.

Future hangar requirements were developed with the assumption that a majority of aircraft owners would prefer enclosed storage and that the percentage of total based aircraft within enclosed hangar facilities would remain nearly the same through the planning period. T-hangar requirements were determined by providing approximately 1,500 square feet of space for each hangar and 1,200 square feet for aircraft within conventional hangars. A smaller area is planned for aircraft in larger conventional hangars since space within these hangars is managed and aircraft maneuvered to make maximum advantage of the floor space available. A larger portion of the aircraft projected for enclosed aircraft storage were anticipated to be located within T-hangars, as is the current trend at the airport.

As indicated on the exhibit, additional hangar space is expected to be required through the planning period. The two large vacant conventional hangars (totaling approximately 115,000 square feet) mask, to a certain extent, the growth anticipated for conventional hangars. The short term planning horizon projects a need for an additional 51,000 square feet of hangar space. By comparing the short term conventional hangar requirement to the total conventional hangar space, the need for conventional hangar space can be overlooked. The need for conventional hangar space will be driven, in part, by the growth of general aviation services at the airport and the need to accommodate these users. Therefore, additional conventional hangar will be examined in this study.

Similar to existing conditions, it is expected that aircraft storage hangar requirements will continue to be met through a combination of hangar types. The alternatives analysis will examine the options available for hangar development at the airport and determine the best location for each type of hangar facility.

00MP16-3G-2/6/02

AIRCRAFT STORAGE HANGARS REQUIREMENTS

	AVAILABLE	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Aircraft to be Hangared	754	866	944	1,102
T-Hangar/Port-A-Port/Executive Hangar Positions	502	577	629	734
Commercial Hangar Positions	N/A	79	86	101
Hangar Area Requirements				
T-Hangar Area (s.f.)	762,700	876,000	955,000	1,115,000
Subtotal Commercial Hangar Area (s.f)[1]	475,200	411,200	443,800	518,800
Total Hangar Area (s.f.)	1,122,900	1,287,200	1,398,800	1,633,800

[1] Excluding Museum Hangars

AIRCRAFT PARKING APRON

	AVAILABLE	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Single, Multi-Engine Transient Aircraft Positions		55	65	83
Apron Area (s.y.)		52,800	62,100	80,000
Transient Business Jet Positions		10	11	15
Apron Area (s.y.)		15,500	18,300	23,500
Locally-Based Aircraft Positions		101	110	129
Apron Area (s.y.)		97,000	105,600	123,800
Total Positions	220	166	186	227
Total Apron Area (s.y.)	377,100	165,300	186,000	227,300

TERMINAL BUILDING & OTHER FACILITIES

	AVAILABLE	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
General Aviation Terminal Facilities (s.f.)	N/A	9,400	10,900	14,200
Aircraft Wash/Owner's Maintenance			Aircraft Wash Rack	Covered Aircraft Owner's Maintenance Facility/Wash Rack

CHINO AIRPORT

Exhibit 3G
LANDSIDE FACILITY REQUIREMENTS

AIRCRAFT PARKING APRON

A parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. Approximately 220 tiedowns are available for based and transient aircraft at the airport. Although the majority of future based aircraft were assumed to be stored in an enclosed hangar, a number of based aircraft will still tiedown outside.

Along with based aircraft parking needs, transient aircraft parking needs must also be considered in determining apron requirements. Chino Airport accommodates a significant level of transient activity annually.

Total apron area requirements were determined by applying a planning criterion of 960 square yards per based and transient aircraft parking position. Transient business jet positions were determined by applying a planning criterion of 1,600 square yards for each transient business jet position. The results of this analysis are presented on **Exhibit 3G**. Based upon the planning criteria above and assumed transient and based aircraft users, no additional apron area is expected to be needed through the planning period. However, additional apron area in excess of these needs may be needed as new hangar areas are developed on the airport which are not contiguous with the existing apron areas.

TERMINAL FACILITIES

Terminal building space is typically provided for waiting passengers, a pilots' lounge, flight planning, concessions, management, storage, and various other needs. Presently, these functions are being provided separately in the various conventional hangars at the airport. Future terminal requirements have been determined to anticipate the development of a dedicated public terminal building and are shown on **Exhibit 3G**.

AIRCRAFT WASH FACILITY

Presently, there are no designated aircraft wash facilities on the airport. Consideration should be given to establishing an aircraft wash facility at the airport to collect aircraft cleaning fluids used during the cleaning process.

Other airports have combined an aircraft owner maintenance facility with the wash facility. This typically has involved covering the wash rack area. These areas provide for the collection of used aircraft oil and other hazardous materials and provide a covered area for aircraft washing and light maintenance. The development of a similar facility at Chino Airport could reduce environmental exposure and provide an additional revenue source which could be used to amortize development costs. The airport maintains an oil collection station on the north side of the airport, near Merrill Drive.

AIRPORT ACCESS

Regionally, vehicle access to the airport is provided by Euclid Avenue. Euclid Avenue is a divided four-lane road, which connects the airport with State

Highway 60 to the north and State Highway 91 to the south (via State Highway 71). The current capacity of Euclid Avenue should be sufficient to accommodate the growth in aviation facilities anticipated for Chino Airport. Capacity along this road will be impacted to a greater extent by the growth in residential, industrial, and commercial uses within the Chino Valley Dairy Preserve.

Merrill Avenue extends across the northern portion of the airport site. Kimball Avenue extends along the southern border of the airport. Both roadways are presently two lanes wide. Both the City of Chino and City of Ontario land use plans for the Chino Valley Diary Preserve conversion call for Euclid Avenue to be upgraded to an eight-lane parkway. Merrill Avenue and Kimball Avenue are both planned as standard four-lane arterials.

Cal Aero Drive provides primary access to the landside facilities along Apron Area A and Apron Area B. Presently, all vehicles destined for facilities in this airport area use a single gate located at the terminus of Cal Aero Drive along Taxiway B. Vehicles accessing any landside facility on Apron Area A proceed across the aircraft parking apron and taxilanes to their desired location. Vehicles bound for Apron Area B utilize the apron in front of the ATCT. Current plans call for moving this gate to the north, prior to an existing roadway extending along the northern side of the ATCT. This is intended to eliminate the high volume of vehicles crossing in front of the ATCT.

A planning goal of any master plan is to segregate aircraft and vehicle operational areas to the extent practicable. Special emphasis is always given to segregating public vehicle access and aircraft operational areas. In comparison to based aircraft owners, which at many airports are allowed to access their aircraft via aircraft taxilanes, the general public is generally restricted from these areas. The general public is not aware of the distinctions between aircraft operational areas and the operating characteristics of aircraft. While the current vehicle access point is equipped with an automated gate, access can be gained through either knowledge of the entrance code or by contacting any tenant on the airport which can remotely open the gate. Considering the new emphasis on security and the need to enhance the safety of aircraft operations, Chapter Four will examine options for segregating vehicle and aircraft operational areas.

AIRPORT MAINTENANCE

The Chino Airport maintenance staff operates from a portion of Dome Hangar #1. Consideration should be given to developing a maintenance facility for the storage of maintenance equipment and to provide work areas for airport maintenance employees. An airport maintenance facility can be located in a more remote location of the airport and does not specifically require a flight line location, just access to the airfield. The airport maintenance facility should be located to provide for public vehicle access without the need to cross aircraft operational areas.

FENCING

The airport perimeter and the apron areas are equipped with six-foot chain link fencing. The fencing is topped with three-strand barbed wire. There are currently no regulatory requirements for fencing at general aviation airports. However, the existing fencing at Chino Airport is similar to fencing in place at commercial service airports with fencing requirements. This fencing reduces the potential for inadvertent wildlife access to the airport. The automated access gate restricts access to the aircraft operational areas. The existing fencing and gates are sufficient for current security and access restrictions and should be maintained through the planning period.

UTILITIES

Electrical, water, and sanitary sewer services are available at the airport. No information collected during the inventory effort revealed any deficiencies in providing electrical service at the airport. Therefore, it is assumed that all future electrical needs will be sufficiently met. The airport is served by public water and sanitary sewer services. These are expected to be sufficient through the planning period. Storm drainage is a concern, especially along the apron areas along Cal Aero Drive, which accumulate standing water during heavy downpours. Storm drainage improvements are included in current capital planning by San Bernardino County. While the existing utilities should be sufficient, new aviation facilities (hangars, terminal buildings) will likely require new utility extensions to primary service lines and should be included in future design estimates.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Chino Airport through the long term planning horizon. The next step is to develop a direction for development to best meet these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and costs.